

**What Is Claimed Is:**

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~~CLAIM 1~~

1                    1. A method for maximizing satellite con-  
2                    stellation coverage at predetermined local times for a  
3                    set of predetermined geographic locations, the method  
4                    comprising:

5                    determining a satellite constellation having  
6                    a first coverage, the constellation including at least  
7                    one desired satellite wherein each of the at least one  
8                    desired satellites have a trajectory associated there-  
9                    with;

10                   determining a period of rotation for each of  
11                   the desired satellites;

12                   determining a time dependent coverage of the  
13                   satellite constellation based on the period of rotation  
14                   and the trajectory of each of the desired satellites;

15                   tilting the trajectory of at least one of the  
16                   desired satellites to obtain a second coverage based on  
17                   the time dependent coverage, the second coverage provid-  
18                   ing maximum coverage at the predetermined local times  
19                   for the set of predetermined geographic locations; and

20                   generating command signals for modifying the  
21                   trajectory of the at least one desired satellite.

1                   2. The method as recited in claim 1 wherein  
2                   generating the command signals includes programming a  
3                   computer with orbital parameters based on the tilted  
4                   trajectory.

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~~CLAIM 2~~

1                   3. The method as recited in claim 2 further  
2                   comprising launching the at least one desired satellite  
3                   with the orbital parameters programmed therein.

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1           4.    The method as recited in claim 1 wherein  
2   generating the command signals includes transmitting the  
3   command signals to the at least one desired satellite.

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1           5.    The method as recited in claim 1 wherein  
2   determining the period of rotation includes determining  
3   if the trajectory of the at least one desired satellite  
4   is equatorial.

1           6.    The method as recited in claim 5 wherein  
2   determining the period includes determining the period  
3   of rotation according to the following if the trajectory  
4   is equatorial:

$$P = [ m_s D_s D_N / (n D_N + m_s D_s) ],$$

6   where,

7           P is the orbit period with its sign indicating  
8   whether it is a direct or retrograde orbit;

9           n is an integer with its absolute value equal  
10   to the number of times that the satellite transverses  
11   the same geographic longitude within the repeating  
12   period;

13           m<sub>s</sub> is the number of mean solar day per repeat-  
14   ing period and must be a positive integer relatively  
15   prime to n;

16           D<sub>s</sub> is the mean solar day, which is 24 hours or  
17   1440 minutes; and

18           D<sub>N</sub> is the nodal day which is the period of the  
19   earth-rotation relative to the ascending node or any  
20   point of the orbit plane.

1           7.    The method as recited in claim 5 wherein  
2   determining the period includes determining the period  
3   of rotation according to the following if the trajectory  
4   is not equatorial:

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$$P = \frac{T}{n+m_N}$$

5 where,  
6  $m_N$  is the number of nodal day per repeating  
7 period which must be a positive integer relatively prime  
8 to  $n$ ; and  
9  $T$  is the repeating period that the coverage  
10 pattern starts to repeat itself.

1 8. The method as recited in claim 1 wherein  
2 determining the time dependent coverage includes per-  
3 forming a simulation.

1 9. The method as recited in claim 1 wherein  
2 the trajectory is defined by a first coordinate system  
3 and wherein tilting the trajectory comprises:  
4 translating the first coordinate system into  
5 rotation matrices;  
6 transforming the rotation matrices based on  
7 the tilting; and  
8 determining a second coordinate system based  
9 on the transformed rotation matrices.

1 10. A system for maximizing satellite con-  
2 stellations coverage at predetermined local times for a  
3 set of predetermined geographic locations, the satellite  
4 constellation having a first coverage and including at  
5 least one desired satellite wherein each of the at least  
6 one desired satellites have a trajectory associated  
7 therewith, the system comprising:  
8 a processor operative to determine a period of  
9 rotation for each of the desired satellites, determine  
10 a time dependent coverage of the satellite constellation  
11 based on the period of rotation and the trajectory of

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12 each of the desired satellites, and to tilt the trajec-  
13 tory of at least one of the desired satellites to obtain  
14 a second coverage based on the time dependent coverage,  
15 the second coverage providing maximum coverage at the  
16 predetermined local times for the set of predetermined  
17 geographic locations; and  
18 means for generating command signals for  
19 modifying the trajectory of the at least one desired  
20 satellite.

1 11. The system as recited in claim 10 wherein  
2 the means for generating is a computer programmed to  
3 launch the at least one desired satellite into space  
4 with the modified trajectory.

1 12. The system as recited in claim 11 wherein  
2 the trajectory is a theoretical trajectory.

1 13. The system as recited in claim 10 wherein  
2 the means for generating is a satellite ground station  
3 operative to transmit and receive signals to and from  
4 the at least one desired satellite.

1 14. The system as recited in claim 13 wherein  
2 the trajectory is an actual trajectory.

1 15. The system as recited in claim 10 wherein  
2 the processor, in determining the period of rotation, is  
3 further provided for determining if the trajectory of  
4 the at least one desired satellite is equatorial.

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Sub 15

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1           16. The system as recited in claim 15 wherein  
2 the processor, in determining the period, is further  
3 operative to determine the period of rotation according  
4 to the following if the trajectory is equatorial:

$$P = [ m_s D_s D_N / (n D_N + m_s D_s) ],$$

5 where,

6           P is the orbit period with its sign indicating  
7 whether it is a direct or retrograde orbit;

8           n is an integer with its absolute value equal  
9 to the number of times that the satellite transverses  
10 the same geographic longitude within the repeating  
11 period;

12            $m_s$  is the number of mean solar day per repeat-  
13 ing period and must be a positive integer relatively  
14 prime to n;

15            $D_s$  is the mean solar day, which is 24 hours or  
16 1440 minutes; and

17            $D_N$  is the nodal day which is the period of the  
18 earth-rotation relative to the ascending node or any  
19 point of the orbit plane.  
20

1           17. The system as recited in claim 15 wherein  
2 the processor, in determining the period, is further  
3 operative to determine the period of rotation according  
4 to the following if the trajectory is not equatorial:

$$P = \frac{T}{n+m_N}$$

5 where,

6            $m_N$  is the number of nodal day per repeating  
7 period which must be a positive integer relatively prime  
8 to n; and

9           T is the repeating period that the coverage  
10 pattern starts to repeat itself.

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1                   18. The system as recited in claim 10 wherein  
2 the processor, in determining the time dependent cover-  
3 age, is further operative to perform a simulation.

1                   19. The system as recited in claim 10 wherein  
2 the trajectory is defined by a first coordinate system  
3 and wherein the processor, in tilting the trajectory, is  
4 further operative to translate the first coordinate  
5 system into rotation matrices, transform the rotation  
6 matrices based on the tilting, and determine a second  
7 coordinate system based on the transformed rotation  
8 matrices.

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